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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/544,271	08/03/2005	Tae-Kyung Yoo	718936.6	1323
27128 7590 08/06/2007 BLACKWELL SANDERS LLP 720 OLIVE STREET SUITE 2400 ST. LOUIS, MO 63101			EXAMINER KIM, JAY C	
			ART UNIT 2815	PAPER NUMBER
			MAIL DATE 08/06/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/544,271

Applicant(s)

YOO ET AL.

Examiner

Jay C. Kim

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 September 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>8/3/05</u> | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

This Office Action is in response to the Application filed August 3, 2005.

Drawings

1. The drawings filed September 30, 2005 are objected to because the lines and numbers are smeared in Fig. 1. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities:

On line 8 of [0014], "that" should be replaced by "because".

On line 5 of [0015], ". Most" should be replaced by "most".

On line 5 of [0046], a word is missing between "low" and "formed".

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nobuyuki et al. (Machine translation of JP H10-084159) as modified by Edmond et al. (US 5,338,944) and further in view of Sung et al. (US 2002/0179918).

In regards to claims 1, 4 and 6, Nobuyuki et al. disclose a III-nitride semiconductor light emitting device (Fig. 1) comprising a plurality of III-nitride semiconductor layers (layers 102-108) including an active layer (105) (lines 1-2 of [0019]) inherently emitting light by recombination of electrons and holes, the plurality of III-nitride semiconductor layers (layers 102-108) having a p-type III-nitride semiconductor layer (108) (lines 4-5 of [0021]) at the top thereof, a SiC layer (109)

(lines 1-2 of [0023]) grown on the p-type III-nitride semiconductor layer (108), the SiC layer (109) having a p-type conductivity and a thickness of 1,000 Å (lines 1-2 of [0023]), and a p-side electrode made of nickel and gold (113 and 114 combined) (lines 2-3 of [0028]) formed on the SiC layer (109).

Nobuyuki et al. differ from the claimed invention by not comprising the SiC layer having an n-type conductivity and a thickness of 5 to 500 Å for the holes to be injected into the p-type III-nitride semiconductor layer by tunneling.

Edmond et al. disclose a SiC semiconductor light emitting device (Fig. 3) comprising a top SiC contact layer (56) having an n-type conductivity (col. 6, lines 67-68 and col. 7, lines 6-8) to take advantage of greater conductivity and optical characteristics of n-type SiC layer (col. 7, lines 10-12).

Since both Nobuyuki et al. and Edmond et al. teach a semiconductor light emitting device comprising a SiC substrate and a SiC p-side contact layer, it would have been obvious to the one of ordinary skill in the art at the time the invention was made to combine the III-nitride semiconductor light emitting device disclosed by Nobuyuki et al. with the n-type p-side SiC contact layer disclosed by Edmond et al., because the n-type p-side SiC contact layer would have greater conductivity and better optical characteristics, and easier to form than p-type p-side SiC contact layer (col. 7, lines 12-16 in Edmond et al.).

Further regarding claim 1, Nobuyuki et al. as modified by Edmond et al. differ from the claimed invention by not comprising the SiC layer having a thickness of 5 to

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500 Å for the holes to be injected into the p-type III-nitride semiconductor layer by tunneling.

Sung et al. disclose a III-nitride semiconductor light emitting device (Fig. 1) where the thickness of the n-type p-side contact layer (20) (lines 13-14 of [0011]) is 20 Å (lines 2-4 of [0013]) for the holes to be injected into the p-type III-nitride semiconductor layer by tunneling, which is reverse-tunneling.

Since both Nobuyuki et al. and Sung et al. teach a III-nitride semiconductor light emitting device, it would have been obvious to the one of ordinary skill in the art at the time the invention was made to combine the III-nitride semiconductor light emitting device disclosed by Nobuyuki et al. as modified by Edmond et al. with the thickness of the contact layer disclosed by Sung et al., because the thickness of the contact layer can be controlled to optimize reverse-tunneling to improve the performance of the III-nitride semiconductor light emitting device.

In regards to claim 2, Nobuyuki et al. as modified by Edmond et al. and further in view of Sung et al. disclose the III-nitride semiconductor light emitting device of claim 1.

Nobuyuki et al. as modified by Edmond et al. and further in view of Sung et al. differ from the claimed invention by not showing that the doping concentration of the SiC layer is in a range from 1×10^{18} to 1×10^{22} atoms/cm³.

Edmond et al. further disclose that in another embodiment of a SiC semiconductor light emitting device (Fig. 1), the doping concentration of the top SiC contact layer (23) (col. 5, line 11) is greater than 1×10^{19} atoms/cm³ (col. 6, lines 54-56).

Since both Nobuyuki et al. and Edmond et al. teach a semiconductor light emitting device comprising a SiC substrate and a SiC p-side contact layer, it would have been obvious to the one of ordinary skill in the art at the time the invention was made to combine the III-nitride semiconductor light emitting device disclosed by Nobuyuki et al. as modified by Edmond et al. and further in view of Sung et al. with the n-type doping concentration of the p-side SiC contact layer disclosed by Edmond et al., because the doping concentration of the contact layer can be controlled to improve the performance of the III-nitride semiconductor light emitting device.

In regards to claim 3, Nobuyuki et al. as modified by Edmond et al. and further in view of Sung et al. disclose the III-nitride semiconductor light emitting device of claim 1.

Nobuyuki et al. as modified by Edmond et al. and further in view of Sung et al. differ from the claimed invention by not showing that the growth temperature of the SiC layer is in a range from 600 °C to 1200 °C.

The limitation "the growth temperature of the SiC layer is in a range from 600 °C to 1200 °C" is a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. Note that a product by process claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marosi et al, 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a product by process claim, and not the patentability of the process, and

that an old or obvious product by a new method is not patentable as a product, whether claimed in product by process claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

In regards to claim 5, Nobuyuki et al. as modified by Edmond et al. and further in view of Sung et al. disclose the III-nitride semiconductor light emitting device of claim 1.

Nobuyuki et al. as modified by Edmond et al. and further in view of Sung et al. differ from the claimed invention by not showing that the p-side electrode is made of ITO (Indium Tin Oxide).

Sung et al. further disclose that the p-side electrode (17) (lines 5-6 of [0012]) is made of ITO (lines 1-4 of [0015]).

Since both Nobuyuki et al. and Sung et al. teach a III-nitride semiconductor light emitting device, it would have been obvious to the one of ordinary skill in the art at the time the invention was made to combine the III-nitride semiconductor light emitting device disclosed by Nobuyuki et al. as modified by Edmond et al. and further in view of Sung et al. with the p-side electrode of ITO disclosed by Sung et al., because ITO is a well-known electrode material for a III-nitride semiconductor light emitting device.

5. Claims 7, 8, 11, 13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nobuyuki et al. (Machine translation of JP H10-084159) as modified by Nishi et al. (US 2003/0111666) as evidenced by Shi et al. (US 6,130,001).

In regards to claims 7, 13 and 15, Nobuyuki et al. disclose a III-nitride semiconductor light emitting device (Fig. 1) comprising a plurality of III-nitride

semiconductor layers (layers 102-108) including an active layer (105) (lines 1-2 of [0019]) inherently emitting light by recombination of electrons and holes, the plurality of III-nitride semiconductor layers (layers 102-108) having a p-type III-nitride semiconductor layer (108) (lines 4-5 of [0021]) at the top thereof, a SiC layer (109) (lines 1-2 of [0023]) grown on the p-type III-nitride semiconductor layer (108), and a p-side electrode made of nickel and gold (113 and 114 combined) (lines 2-3 of [0028]) formed on the SiC layer (109).

Nobuyuki et al. differ from the claimed invention by not comprising a $\text{Si}_a\text{C}_b\text{N}_c$ ($a \geq 0$, $b > 0$, $c > 0$) grown on the p-type III-nitride semiconductor layer.

Nishi et al. disclose a light emitting device (Fig. 1) comprising an active layer (112) (lines 3-4 of [0061]) and a p-side contact layer (111) (line 2 of [0061]) where the active layer (112) can be inorganic materials and the p-side contact layer (111) can be C_xN_y layer (lines 2-8 of [0065]) as evidenced by Shi et al. (col. 2, lines 38-40).

Since both Nobuyuki et al. and Nishi et al. teach a light emitting device, it would have been obvious to the one of ordinary skill in the art at the time the invention was made to combine the III-nitride semiconductor light emitting device disclosed by Nobuyuki et al. with the C_xN_y p-side contact layer disclosed by Nishi et al., because C_xN_y is a well-known hole injection layer material in the light emitting device.

In regards to claim 8, Nobuyuki et al. as modified by Nishi et al. as evidenced by Shi et al. disclose the III-nitride semiconductor light emitting device of claim 7.

Nobuyuki et al. as modified by Nishi et al. as evidenced by Shi et al. differ from the claimed invention by not showing that the growth temperature of the C_xN_y layer is in

a range from 600 °C to 1200 °C.

The limitation “the growth temperature of the C_xN_y layer is in a range from 600°C to 1200°C” is a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. Note that a product by process claim is directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See also *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and *In re Marosi et al*, 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a product by process claim, and not the patentability of the process, and that an old or obvious product by a new method is not patentable as a product, whether claimed in product by process claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

In regards to claim 11, Nobuyuki et al. further disclose for the III-nitride semiconductor light emitting device of claim 7 that the p-side contact layer (109) has a p-type conductivity (lines 1-2 of [0023]).

6. Claims 9, 10, 12 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nobuyuki et al. (Machine translation of JP H10-084159) as modified by Nishi et al. (US 2003/0111666) as evidenced by Shi et al. (US 6,130,001) as applied to claim 7 above, and further modified by Sung et al. (US 2002/0179918). The

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teachings of Nobuyuki et al. as modified by Nishi et al. as evidenced by Shi et al. are discussed above.

In regards to claims 9, 10 and 12, Nobuyuki et al. as modified by Nishi et al. as evidenced by Shi et al. disclose the III-nitride semiconductor light emitting device of claim 7.

Nobuyuki et al. as modified by Nishi et al. as evidenced by Shi et al. differ from the claimed invention by not showing that the doping concentration of the C_xN_y layer is in a range from 1×10^{18} to 1×10^{22} atoms/cm³ (claim 9), the C_xN_y layer has a thickness of 5 Å to 500 Å (claim 10), and the C_xN_y layer has an n-type conductivity (claim 12).

Sung et al. disclose a III-nitride semiconductor light emitting device (Fig. 1) where the doping concentration and the thickness of the n-type conductivity, p-side contact layer (20) (lines 13-14 of [0011]) is 1.5×10^{20} atoms/cm³ and 20 Å (lines 2-4 of [0013]).

Since both Nobuyuki et al. and Sung et al. teach a III-nitride semiconductor light emitting device, it would have been obvious to the one of ordinary skill in the art at the time the invention was made to combine the III-nitride semiconductor light emitting device disclosed by Nobuyuki et al. as modified by Nishi et al. as evidenced by Shi et al. with the doping concentration, thickness and conductivity type of the p-side contact layer disclosed by Sung et al., because the doping concentration, thickness and conductivity type of the p-side contact layer can be controlled to improved the performance of the III-nitride semiconductor light emitting device.

In regards to claim 14, Nobuyuki et al. as modified by Nishi et al. as evidenced by Shi et al. and further modified by Sung et al. disclose the III-nitride semiconductor light emitting device of claim 7.

Nobuyuki et al. as modified by Nishi et al. as evidenced by Shi et al. and further modified by Sung et al. differ from the claimed invention by not showing that the p-side electrode is made of ITO (Indium Tin Oxide).

Sung et al. further disclose that the p-side electrode (17) (lines 5-6 of [0012]) is made of ITO (lines 1-4 of [0015]).

Since both Nobuyuki et al. and Sung et al. teach a III-nitride semiconductor light emitting device, it would have been obvious to the one of ordinary skill in the art at the time the invention was made to combine the III-nitride semiconductor light emitting device disclosed by Nobuyuki et al. as modified by Nishi et al. as evidenced by Shi et al. and further modified by Sung et al. with the p-side electrode of ITO disclosed by Sung et al., because ITO is a well-known electrode material for a III-nitride semiconductor light emitting device.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jay C. Kim whose telephone number is (571) 270-1620. The examiner can normally be reached on 7:30 AM - 5:00 PM EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

J. K.
July 30, 2007

Matthew C. Landau
Matthew C. Landau
7/31/07